WHAT IS CLAIMED IS:

1. A database divisional management method for use with a parallel database system having a storage medium, storage and management means for storing and managing a database in said storage medium, and a plurality of access means for accessing said database in response to query inputs, said database divisional management method comprising the steps of:

generating a procedure for processing said query inputs;

dividing said database into a plurality of partitions in accordance with the load pattern provided for executing the generated processing procedure; and

determining the number of access means for simultaneously accessing the partitions of said database.

2. A database divisional management method according to claim 1, wherein said storage and management means determines the physical addresses corresponding to logical addresses at which said plurality of access means access said partitions of said database.

3. A database divisional management method according to claim 1, wherein said load pattern is determined by the access efficiency of each of said

access means and by the amount of information stored in said partitions of said database accessed by said access means.

4. A database divisional management method for use with a parallel database system comprising an FES node for generating a processing procedure in response to query input information, BES nodes for accessing a database on the basis of said processing procedure generated by said FES node, an IOS node having a storage medium and capable of storing and managing said database in said storage medium, and a network for connecting the FES, BES and IOS nodes, said database divisional management method comprising the steps of:

calculating the load pattern by which to perform database processing using said processing procedure; and

determining the number of processors assigned to said FES node, the number of processors assigned to said BES nodes and the number of processors assigned to said IOS node in accordance with said load pattern.

5. A database divisional management method according to claim 4, further comprising the step of determining the number of storage medium units of said IOS node and the number of partitions in each of said storage medium units in accordance with said load

pattern.

6. A database divisional management method according to claim 5, wherein said storage medium units are disk units and wherein the number of disk units of

5   said IOS node and the number of partitions of said disk units are determined in accordance with said load pattern.

7. A database divisional management method according to claim 4, further comprising the step of

10   causing said FES node to analyze and optimize said query input information.

8. A database divisional management method for use with a parallel database system comprising an FES node for generating a processing procedure in response

15   to query input information, BES nodes having a storage medium in which to store a database and capable of accessing said database on the basis of said processing procedure generated by said FES node, and a network for connecting the FES and BES nodes, said database

20   divisional management method comprising the steps of:

calculating the load pattern by which to perform database processing using said processing procedure; and

determining the number of processors assigned

25   to said FES node, the number of processors assigned to

said BES nodes, the number of storage medium units of said BES nodes, and the number of partitions of said storage medium in accordance with said load pattern.

9. A database divisional management method for
5 use with a parallel database system comprising an FES node for generating a processing procedure in response to query input information, BES nodes for accessing a database on the basis of said processing procedure generated by said FES node, an IOS node having a storage
10 medium and capable of storing and managing said database in said storage medium, and a network for connecting the FES, BES and IOS nodes, said database divisional management method comprising the steps of:

determining the upper limit number of pages
15 which are accessible in parallel and which require a constant time each when said database is scanned for access thereto; and

determining the number of processors assigned to said FES node, the number of processors assigned to
20 said BES nodes, and the number of processors assigned to said IOS node in accordance with said upper limit number of pages.

10. A database divisional management method according to claim 9, further comprising the step of
25 determining the number of storage medium units of said

IOS nodes and the number of partitions in each of said storage medium units.

11. A database divisional management method for use with a parallel database system comprising an FES node for generating a processing procedure in response to query input information, BES nodes having a storage medium in which to store and manage a database and capable of accessing said database on the basis of said processing procedure generated by said FES node, and a network for connecting the FES and BES nodes, said database divisional management method comprising the steps of:

determining the upper limit number of pages which are accessible in parallel and which require a constant time each when said database is scanned for access thereto; and

determining the number of processors assigned to said FES node, the number of processors assigned to said BES nodes, the number of storage medium units of said BES nodes, and the number of partitions of said storage medium units in accordance with said upper limit number of pages.

12. A database divisional management method for use with a parallel database system comprising an FES node for generating a processing procedure in

response to query input information, BES nodes for accessing a database on the basis of said processing procedure generated by said FES node, an IOS node having a storage medium and capable of storing and managing

5   said database in said storage medium, and a network for connecting the FES, BES and IOS nodes, said database divisional management method comprising the steps of:

      calculating the expected degree of parallelism p according to the load pattern based on said processing

10   procedure; and

      determining the number of processors assigned to said FES node, the number of processors assigned to said BES nodes, and the number of processors assigned to said IOS node in accordance with said expected degree of

15   parallelism p.

      13.   A database divisional management method for use with a parallel database system comprising an FES node for generating a processing procedure in response to query input information, BES nodes having a

20   storage medium in which to store and manage a database and capable of accessing said database on the basis of said processing procedure generated by said FES node, and a network for connecting the FES and BES nodes, said database divisional management method comprising the

25   steps of:

calculating the expected degree of parallelism p according to the load pattern based on said processing procedure; and

determining the number of processors assigned

5 to said FES node, the number of processors assigned to said BES nodes, the number of storage medium units of said BES nodes, and the number of partitions of said storage medium units in accordance with said expected degree of parallelism p.

10 14. A database divisional management method according to claim 4, further comprising the steps of:

calculating the optimum number of accessible pages m;

calculating the number of pages s (=m/p,

15 wherein p denotes an expected degree of parallelism) in units of sub-key ranges if key range partitions exist; and

having sub-key range partitions in units of s pages for inserting data into a disk apparatus.

20 15. A database divisional management method according to claim 8, further comprising the steps of:

calculating the optimum number of accessible pages m;

calculating the number of pages s (=m/p,

25 wherein p denotes an expected degree of parallelism) in

units of sub-key ranges if key range partitions exist; and

having sub-key range partitions in units of s pages for inserting data into a disk apparatus.

5　　16. A database divisional management method according to claim 9, further comprising the steps of:

calculating the optimum number of accessible pages m;

calculating the number of pages s ($=m/p$,

10 wherein p denotes an expected degree of parallelism) in units of sub-key ranges if key range partitions exist; and

having sub-key range partitions in units of s pages for inserting data into a disk apparatus.

15　　17. A database divisional management method according to claim 11, further comprising the steps of:

calculating the optimum number of accessible pages m;

calculating the number of pages s ($=m/p$,

20 wherein p denotes an expected degree of parallelism) in units of sub-key ranges if key range partitions exist; and

having sub-key range partitions in units of s pages for inserting data into a disk apparatus.

25　　18. A database divisional management method

according to claim 12, further comprising the steps of:

calculating the optimum number of accessible pages m;

calculating the number of pages s in units of

5 sub-key ranges if key range partitions exist, said number of pages s being equal to said optimum number of accessible pages m divided by said expected degree of parallelism p; and

having sub-key range partitions in units of s

10 pages for inserting data into a disk apparatus.

19. A database divisional management method according to claim 13, further comprising the steps of:

calculating the optimum number of accessible pages m;

15 calculating the number of pages s in units of sub-key ranges if key range partitions exist, said number of pages s being equal to said optimum number of accessible pages m divided by said expected degree of parallelism p; and

20 having sub-key range partitions in units of s pages for inserting data into a disk apparatus.

20. A database divisional management method for use with a parallel database system comprising an FES node for generating a processing procedure in

25 response to query input information, BES nodes for

accessing a database on the basis of said processing
procedure generated by said FES node, an IOS node having
a storage medium and capable of storing and managing
said database in said storage medium, and a network for

5   connecting the FES, BES and IOS nodes, said database
divisional management method comprising the steps of:

detecting a load unbalance on the basis of at
least one of the load information items consisting of
the number of accessed pages, the number of hit rows and

10   the number of communications acquired during execution
of said processing procedure; and

changing the number of processors assigned to
said FES node, the number of processors assigned to said
BES nodes, the number of processors assigned to said IOS

15   node, and the number of storage medium units of said IOS
node so as to eliminate said load unbalance.

21. A database divisional management method
for use with a parallel database system comprising an
FES node for generating a processing procedure in

20   response to query input information, BES nodes having a
storage medium in which to store and manage a database
and capable of accessing said database on the basis of
said processing procedure generated by said FES node,
and a network for connecting the FES and BES nodes, said

25   database divisional management method comprising the

steps of:

detecting a load unbalance on the basis of at least one of the load information items consisting of the number of accessed pages, the number of hit rows and

5   the number of communications acquired during execution of said processing procedure; and

changing the number of processors assigned to said FES node, the number of processors assigned to said BES nodes, and the number of storage medium units of

10   said BES nodes so as to eliminate said load unbalance.

22. A database divisional management method according to claim 20, further comprising the steps of:

closing, when online processing is in progress, the key range of a database table if at least one of the

15   three numbers consisting of the number of processors assigned to said BES nodes, the number of processors assigned to said IOS node and the number of storage medium units is to be increased, said database table being the object to be managed by either the processors

20   or the storage medium units to be added;

assigning the processors and the storage medium units anew;

succeeding lock information and directory information;

25   updating the dictionary information necessary

for node assignment control; and

releasing the closing of said key range thereafter if said online processing is still in progress.

5   23.   A database divisional management method according to claim 21, further comprising the steps of:

closing, when online processing is in progress, the key range of a database table if either the number of processors assigned to said BES nodes or the number

10   of storage medium units is to be increased, said database table being the object to be managed by either the processors or the storage medium units to be added;

assigning either the processors or the storage medium units anew;

15   succeeding lock information and directory information;

updating the dictionary information necessary for node assignment control;

moving data from the existing group of storage

20   medium units to the newly added storage medium units; and

releasing the closing of said key range thereafter if said online processing is still in progress.

25   24.   A database divisional management method

according to claim 20, further comprising the steps of:

closing, when online processing is in progress, the key range of a database table if at least one of the three numbers consisting of the number of processors

5   assigned to said BES nodes, the number of processors assigned to said IOS node and the number of storage medium units is to be decreased, said database table being managed by either the processors or the storage medium units to be removed;

10   determining either the processors or the storage medium units to be removed;

succeeding lock information and directory information;

updating the dictionary information necessary

15   for node assignment control; and

releasing the closing of said key range thereafter if said online processing is still in progress.

25. A database divisional management method

20   according to claim 22, further comprising the steps of:

closing, when online processing is in progress, the key range of a database table if at least one of the three numbers consisting of the number of processors assigned to said BES nodes, the number of processors

25   assigned to said IOS node and the number of storage

medium units is to be decreased, said database table being managed by either the processors or the storage medium units to be removed;

determining either the processors or the

5 storage medium units to be removed;

succeeding lock information and directory information;

updating the dictionary information necessary for node assignment control; and

10 releasing the closing of said key range thereafter if said online processing is still in progress.

26. A database divisional management method according to claim 9, further comprising the steps of:

15 closing, when online processing is in progress, the key range of a database table if at least either the number of processors assigned to said BES nodes or the number of storage medium units is to be decreased, said database table being managed by either the processors or

20 the storage medium units to be removed;

determining either the processors or the storage medium units to be removed;

succeeding lock information and directory information;

25 updating the dictionary information necessary

for node assignment control;

    moving data from the storage medium units to be removed to the storage medium units succeeding those units to be removed; and

5   releasing the closing of said key range thereafter if said online processing is still in progress.

    27. A database divisional management method according to claim 23, further comprising the steps of:

10   closing, when online processing is in progress, the key range of a database table if at least either the number of processors assigned to said BES nodes or the number of storage medium units is to be decreased, said database table being managed by either the processors or

15   the storage medium units to be removed;

    determining either the processors or the storage medium units to be removed;

    succeeding lock information and directory information;

20   updating the dictionary information necessary for node assignment control;

    moving data from the storage medium units to be removed to the storage medium units succeeding those units to be removed; and

25   releasing the closing of said key range

thereafter if said online processing is still in progress.

28. A database divisional management method according to claim 20, wherein either the number of

5   processors or the number of storage medium units for database processing is changed dynamically.

29. A database divisional management method according to claim 21, wherein either the number of processors or the number of storage medium units for

10   database processing is changed dynamically.

30. A database divisional management method according to claim 22, wherein either the number of processors or the number of storage medium units for database processing is changed dynamically.

15   31. A database divisional management method according to claim 23, wherein either the number of processors or the number of storage medium units for database processing is changed dynamically.

32. A database divisional management method

20   according to claim 26, wherein either the number of processors or the number of storage medium units for database processing is changed dynamically.

33. A database divisional management system for use with a parallel database system having a storage

25   medium, storage and management means for storing and

managing a database in said storage medium, and a
plurality of access means for accessing said database in
response to query inputs, said database divisional
management system comprising:

5   generation means for generating a procedure for
processing said query inputs;

division means for dividing said database into
a plurality of partitions in accordance with the load
pattern provided for executing the generated processing
10   procedure; and

determination means for determining the number
of access means for simultaneously accessing the
partitions of said database.

34.   A database divisional management system
15   for use with a parallel database system comprising an
FES node for generating a processing procedure in
response to query input information, BES nodes for
accessing a database on the basis of said processing
procedure generated by said FES node, an IOS node having
20   a storage medium and capable of storing and managing
said database in said storage medium, and a network for
connecting the FES, BES and IOS nodes, said database
divisional management system comprising:

calculation means for calculating the load
25   pattern by which to perform database processing using

said processing procedure; and

determination means for determining the number of processors assigned to said FES node, the number of processors assigned to said BES nodes and the number of

5 processors assigned to said IOS node in accordance with said load pattern.

35. A database divisional management system for use with a parallel database system comprising an FES node for generating a processing procedure in

10 response to query input information, BES nodes having a storage medium in which to store a database and capable of accessing said database on the basis of said processing procedure generated by said FES node, and a network for connecting the FES and BES nodes, said

15 database divisional management system comprising:

calculation means for calculating the load pattern by which to perform database processing using said processing procedure; and

determination means for determining the number

20 of processors assigned to said FES node, the number of processors assigned to said BES nodes, the number of storage medium units of said BES nodes, and the number of partitions of said storage medium in accordance with said load pattern.

25 36. A database divisional management system

for use with a parallel database system comprising an

FES node for generating a processing procedure in

response to query input information, BES nodes for

accessing a database on the basis of said processing

5   procedure generated by said FES node, an IOS node having

a storage medium and capable of storing and managing

said database in said storage medium, and a network for

connecting the FES, BES and IOS nodes, said database

divisional management system comprising:

10   determination means for determining the upper

limit number of pages which are accessible in parallel

and which require a constant time each when said

database is scanned for access thereto; and

determination means for determining the number

15   of processors assigned to said FES node, the number of

processors assigned to said BES nodes, and the number of

processors assigned to said IOS node in accordance with

said upper limit number of pages.

37.   A database divisional management system

20   for use with a parallel database system comprising an

FES node for generating a processing procedure in

response to query input information, BES nodes having a

storage medium in which to store and manage a database

and capable of accessing said database on the basis of

25   said processing procedure generated by said FES node,

and a network for connecting the FES and BES nodes, said database divisional management system comprising:

determination means for determining the upper limit number of pages which are accessible in parallel

5 and which require a constant time each when said database is scanned for access thereto; and

determination means for determining the number of processors assigned to said FES node, the number of processors assigned to said BES nodes, the number of

10 storage medium units of said BES nodes, and the number of partitions of said storage medium units in accordance with said upper limit number of pages.

38. A database divisional management system for use with a parallel database system comprising an

15 FES node for generating a processing procedure in response to query input information, BES nodes for accessing a database on the basis of said processing procedure generated by said FES node, an IOS node having a storage medium and capable of storing and managing

20 said database in said storage medium, and a network for connecting the FES, BES and IOS nodes, said database divisional management system comprising:

calculation means for calculating the expected degree of parallelism p according to the load pattern

25 based on said processing procedure; and

determination means for determining the number
of processors assigned to said FES node, the number of
processors assigned to said BES nodes, and the number of
processors assigned to said IOS node in accordance with

5   said expected degree of parallelism p.

39. A database divisional management system
for use with a parallel database system comprising an
FES node for generating a processing procedure in
response to query input information, BES nodes having a

10   storage medium in which to store and manage a database
and capable of accessing said database on the basis of
said processing procedure generated by said FES node,
and a network for connecting the FES and BES nodes, said
database divisional management system comprising:

15   calculation means for calculating the expected
degree of parallelism p according to the load pattern
based on said processing procedure; and

determination means for determining the number
of processors assigned to said FES node, the number of
processors assigned to said BES nodes, the number of
storage medium units of said BES nodes, and the number
of partitions of said storage medium units in accordance
with said expected degree of parallelism p.

add b)